FISHER® Controls

Instruction Manual

9500 Series Butterfly Control Valve Bodies

Form 2433, September 1976

SCOPE OF MANUAL

This manual provides installation, adjustment, and maintenance information for Fisher 9500 Series butterfly valve body assemblies. These valves may be furnished with keyed valve shafts, for use with actuator-mounting brackets and linear-motion actuators such as Fisher Type 480-15 and 656 actuators, or with splined valve shafts, for use with rotary actuators such as Fisher Type 1051 and 1061 actuators. Refer to separate manuals for instructions covering the power actuator or manual handwheel actuator, cast actuator-mounting bracket and linkage, positioner, and other accessories.

INTRODUCTION

The 9500 Series valves are fully lined butterfly valves for use with corrosive process fluids or wherever stringent shut-off is required. The nitrile or TFE liner completely isolates the body and shaft from the process fluid. These valves are available with conventional or patented **Fishtail®** discs. The conventional disc is also available coated with E-CTFE fluoropolymer.

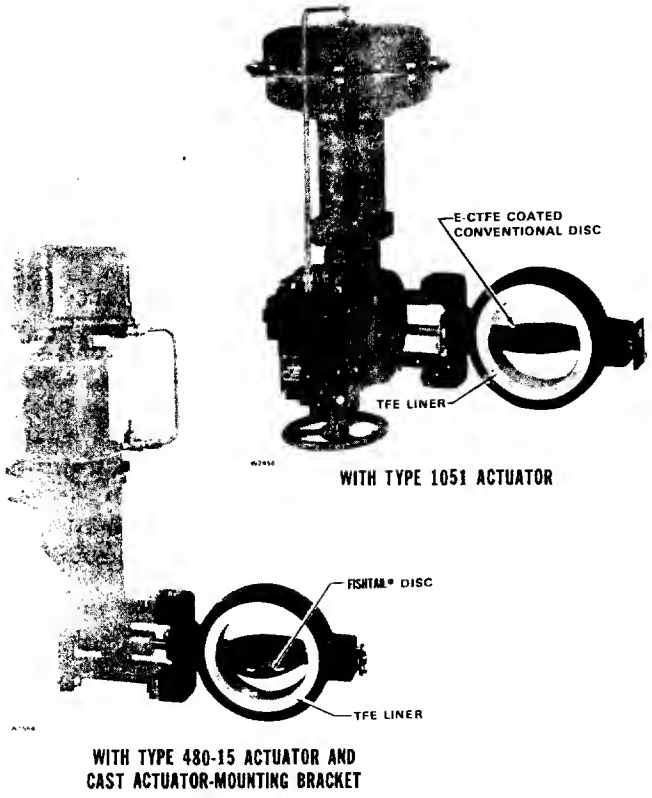


Figure 1. 9500 Series Valves

INSTALLATION

The 9500 Series valves are normally furnished as part of a control valve assembly. That is, the valve will be part of a valve body and actuator assembly. The actuator-valve linkage is adjusted at the factory; there is no need to adjust the linkage before putting the valve into operation. If the valve and actuator are being re-installed after having been disassembled and it is suspected that the linkage is out of adjustment, refer to the "Linkage" portion of the "Adjustments" section before installing. If the valve body has been purchased separately, or if the actuator has been removed, complete the "Actuator Mounting" section before proceeding.

Table 1. Specifications

BODY SIZES	■ 2, ■ 3, ■ 4, ■ 6, ■ 8, ■ 10 and ■ 12 inches
BODY STYLE	Flangeless (wafer-type) body to be installed between pipeline flanges
END CONNECTION STYLES	Mates with ANSI Class ■ 125 flat-face, ■ 150 raised-face, or ■ 300 raised-face flanges
MAXIMUM INLET PRESSURE*	Body design pressure is indicated on valve nameplate; pressure/temperature derating is consistent with applicable ANSI pressure/temperature rating up to maximum operative temperature of valve (see table 2)
MAXIMUM SHUTOFF PRESSURE DROP*	**Standard Operation** ***Uncoated Disc in Cast Iron Body:*** 175 psi ***Uncoated Disc in Steel or Stainless Steel Body:*** 220 psi ***Coated Disc:*** 150 psi ***MTS (Minimum Torque Shutoff) Operation:*** 50 psi (with MTS operation, a smaller actuator has been selected that will shut off the flow against a maximum pressure drop of 50 psi)
OPERATIVE TEMPERATURE*†	See table 2
FLOW CHARACTERISTIC	**Conventional Disc:** Approximately equal percentage through 60 degrees of disc rotation **Fishtail Disc:** Approximately equal percentage through 90 degrees of disc rotation
FLOW DIRECTION	**Conventional Disc:** Either direction **Fishtail Disc:** Tail of disc (as shown in figure 2) to open into downstream side of valve
DISC ROTATION	**Conventional Disc** ***On/Off Service:*** ■ 0 to 60 or ■ 0 to 90 degrees ***Throttling Service:*** 0 to 60 degrees **Fishtail Disc:** 0 to 60 or 0 to 90 degrees for on/off or throttling
SHUTOFF CLASSIFICATIONS	**Standard Operation** ***Nitrile Liner:*** Fisher Class VI (less than one bubble per minute using air at a pressure drop of 220 psi) ***TFE Liner:*** Fisher Class V (0.05 cc/min of air per inch of port diameter/psi) **MTS Operation** ***Nitrile Liner:*** Fisher Class VI (less than one bubble per minute using air at a pressure drop of 50 psi) ***TFE Liner:*** Fisher Class III (0.01% of maximum capacity using air at a pressure drop of 50 psi)
MATING FLANGE CAPABILITIES	All sizes compatible with welding-neck flanges; all sizes except 10-inch compatible with slip-on flanges (also see "Installation" section)
CODE CLASSIFICATIONS	Dimensions meet MSS SP67 specifications for face-to-face dimensions of flangeless valves Valve body, disc and shaft components designed in accordance with allowable stress levels as established by the ASME Boiler and Pressure Vessel Code, Section VIII
APPROXIMATE WEIGHTS (VALVE BODY ASSEMBLIES ONLY)	**2-Inch:** 20 lb **3-Inch:** 25 lb **4-Inch:** 30 lb **6-Inch:** 45 lb **8-Inch:** 60 lb **10-Inch:** 70 lb **12-Inch:** 120 lb

* None of the pressure or temperature limitations in this manual or on the nameplate, nor any applicable code limitation, should be exceeded.

† This term is defined in SAMA Standard PMC 20.1-1973.

Table 2. Operative Temperature

Disc Type	Disc Coating Material	Liner Material	Operative Temperature
Conventional or *Fishtail* Without Coating	...	Nitrile	+20 to 200°F
		TFE	0 to 300°F (To +275°F with steam)
Conventional With Coating	E-CTFE	TFE	0 to +250°F (Do not use with steam)

WARNING

Do not subject the valve to pressures or temperatures beyond those for which the valve is designed, or the valve may fail, causing personal injury.

Maximum design pressure (inlet presure) and ΔP (pressure drop) are shown on the nameplate. Refer to table 2 for temperature limits. If the pressure or temperature limits for a specific construction cannot be determined, contact the Fisher sales representative.

1. If continuous operation will be required during maintenance, install a three-valve bypass around the point of valve installation.

2. Be certain the pipeline flanges are in line with each other.

3. Inspect the valve body to be sure it is free of foreign material. Also be certain the adjacent piping is free of pipe scale, welding slag, and any other material that could damage valve seating surfaces.

4. Measure to be sure the distance between the pipeline flanges is approximately 1/4 inch greater than the valve face-to-face dimension. This will ensure easy installation without distorting the liner.

5. For conventional discs, flow may be in either direction; for **Fishtail** discs, flow direction must be such that the tail of the disc (as shown in figure 2) will rotate into the downstream side of the valve.

WARNING

Observe the following precautions before inserting the valve into the pipeline.

a. The inside diameter of the mating piping or flanges must be large enough to allow the valve disc to rotate freely into the upstream and downstream piping, or the disc could be damaged. Do not use piping or flanges having an inside diameter smaller than the minimum shown in table 3.

b. The inside of the mating flanges must also be small enough to be in full contact with the partial O-rings on the liner faces. Leakage through the flange connections and damage to the liner could result if the liner face O-rings are not properly supported. Do not use flanges having an inside diameter larger than the maximum shown in table 3.

Table 3. Maximum and Minimum Allowable Mating Flange Diameters

BODY SIZE (INCHES)	ALLOWABLE INSIDE DIAMETER OF MATING PIPING OR FLANGES (INCHES)	
	Minimum	Maximum
2	1.20	2.50
3	2.50	3.62
4	3.50	4.62
6	5.70	6.75
8	7.70	8.75
10	9.70	10.75
12	11.70	13.00

The 10-inch size must not be used with slip-on flanges unless flange adaptors are used to support the liner. When using slip-on flanges with other sizes, be certain the valve is carefully centered to ensure that the partial O-rings are in full contact with the adjacent flanges.

c. Flange gaskets should not be used with these valves. The liner faces act as flange gaskets, and improper use of additional gasketing material could damage the liner.

d. The valve disc must be in the closed position when the valve is being inserted into the pipeline. If the valve disc is not closed, it could be damaged against the mating piping or flanges.

e. The lifting eye provided on the 12-inch size is designed to support the weight of the valve under static or varying loads such as are encountered when holding or lifting the valve. The lifting eye is not designed to withstand shock loads. If a crane or hoist slips momentarily and then abruptly stops, the lifting eye will be subjected to a shock load. The lifting eye may fail under such shock loads, allowing the valve to fall and injure personnel or damage equipment.

To avoid such a failure, be certain the crane or hoist is capable of handling the load and be certain the connection between the hoist and lifting eye is secure. After the connection has been made, test the connection by raising the valve slightly. Be certain the load is balanced and will not shift or swing when it is supported by the crane or hoist. Also be certain that no one will be in the way if the valve falls.

6. Insert the valve into the pipeline. Insert four flange studs or bolts through the flanges to support the valve.

7. Center the valve carefully on the flanges by measuring equal distances at the top and bottom and equal distances at the sides.

8. Insert the remaining flange studs or bolts. Tighten the studs or bolts evenly. Normal flange bolt torques may be used because liner compression is limited by metal-to-metal contact between flanges and the body.

9. Rotate the valve disc manually to be certain the disc clears the adjacent piping or flanges as it opens. If necessary, disconnect the power actuator-valve linkage, but do not disturb the adjustment of the turnbuckle or adjustable linkage. If the disc hits the flange, loosen flange bolting temporarily while re-centering the valve. If the problem cannot be corrected in this manner, it will be necessary to use line flanges with larger inside diameters adjacent to the valve.

WARNING

If the process fluid or atmosphere around the valve is flammable, personal injury or equipment damage could result from an explosion caused by discharge of static electricity from valve components. The 9500 Series valves are not necessarily grounded when installed in a pipeline. To reduce the possibility of such injury or damage, ground the valve shaft if process fluid or atmosphere is flammable. Use accepted equipment grounding procedures.

ADJUSTMENTS

Hub Seals

Thrust bushings (key 7, figures 5 and 6) seal the disc hubs. In time, especially with frequent valve disc rotation, these seals may require adjustment.

Adjust the seals if there is leakage through the body around the valve shaft. A small amount of leakage downstream (between the bushings and disc hubs) may also indicate a need for hub seal adjustment as may leakage through the idler shaft (key 5, figure 6) relief hole on coated disc constructions.

To adjust the hub seals:

1. Tighten both thrust-plate cap screws (key 10, figures 5 and 6) 1/4 turn on one side (the side where shaft leakage is occurring).

CAUTION

To avoid excessive side thrust on the disc and possible liner damage, tighten cap screws on both sides of the valve alternately and in 1/4-turn increments. Do not overtighten by continuous turning or by tightening one side only.

2. Tighten both thrust-plate cap screws 1/4 turn on the other side of the valve.

3. Repeat steps 1 and 2 until leakage stops.

Note

If this adjustment is being performed to stop minor leakage past the disc or, for coated-disc constructions, through the shaft relief hole, check the leakage after turning the cap screws enough to move the thrust plates 1/32 inch closer to the valve body. If leakage has not stopped or diminished, the leakage is probably due to incorrect linkage adjustment or damaged valve parts. Refer to the following section to check linkage adjustment; refer to the "Maintenance" section to inspect and replace parts.

4. If leakage around the shaft cannot be stopped by adjusting hub seals, refer to the "Maintenance" section to inspect and replace damaged parts.

Linkage

If the linkage between the power actuator and valve is improperly adjusted, the actuator may reach the end of travel before (or after) the disc reaches the 0-degree (fully closed) position. This could result in leakage past the disc. The linkage adjustment is set at the factory, and it should not be necessary to adjust linkage unless the actuator and valve have been separated and the adjustment altered.

Note

If the control valve is intended for MTS (minimum torque shutoff) operation, the actuator has been selected to have sufficient torque output to shut off the flow against a pressure drop of 50 psi. With MTS operation, the valve disc is not necessarily rotated to the 0-degree position. Adjust linkage for these valves only enough to obtain the desired shutoff capabilities with a 50 psi p essure drop. If adjustment to the 0-degree position is attempted for valves intended for MTS operation, the actuator may stall.

To check the linkage adjustment, refer to figure 2. On the valve shaft (between the valve and actuator) is a partial keyway (keyed valve shafts) or a flat spot (splined valve shafts). This keyway or flat is cut in the same plane as the disc edge. For **Fishtail** discs, the keyway or flat is on the same side of the shaft as the nose or leading edge of the valve disc (as shown in figure 2). When the valve disc is at the 0-degree position, the keyway or flat will be either

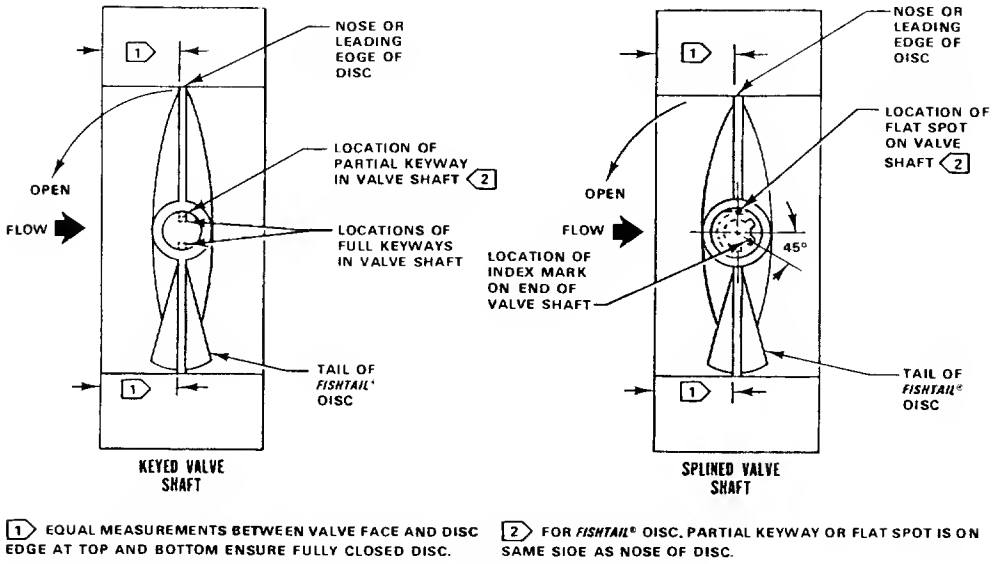


Figure 2. Valve Shaft Marking

top-dead-center or bottom-dead-center in relation to the valve body. The top-dead-center position is shown in figure 2. A more accurate check of the 0-degree disc position can be obtained by removing the valve from the pipeline.

WARNING

To avoid personal injury and damage to the process system, isolate the control valve from all pressure and relieve pressure from the valve body before removing the valve from the line. Be sure the disc is closed so that it will not hit the mating flanges when being removed from the line.

With the valve removed from the line, position the actuator to the valve-closed end of travel. Measure the distance between the valve face and the top and bottom edges of the disc as shown in figure 2. The disc is at the 0-degree position if the two measurements are equal.

To adjust linkage, refer to the cast actuator bracket or manual handwheel instruction manual (for keyed valve shafts) or to the actuator instruction manual (for splined valve shafts), as appropriate.

Three-Way Valve Tandem Linkage

If the valve is used as part of a three-way valve assembly, adjustment of the tandem linkage (see figure 3) may be necessary to ensure proper rotation of the slave valve disc.

If the adjustment is being performed with the three-way valve assembly out of the line, temporarily bolt the valve bodies to the tee to compress the liner faces until there is metal-to-metal contact between the valve bodies and the tee.

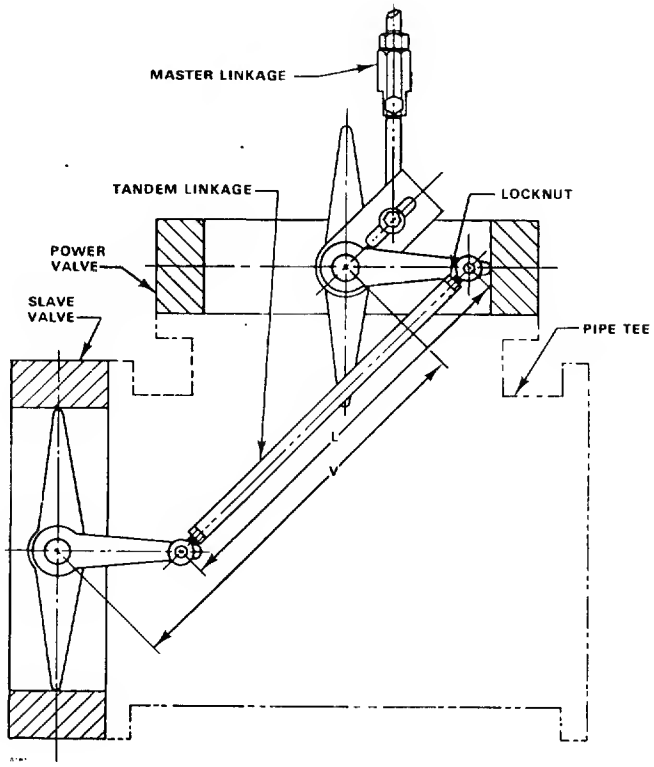


Figure 3. Tandem Linkage Adjustment for Three-Way Valve Assemblies

Table 4. Fault Correction Guide

Fault	Possible Cause	Correction
1. Leakage out sides of valve (at thrust plates) between thrust bushings and shaft	a. Hub seals require adjustment.	a. Adjust per "Hub Seals" portion of "Adjustments" section.
	b. Taper pins not sealed.	b. Remove valve from line and re-seat taper pins or install new taper pins per "Maintenance" section.
2. Leakage out sides of valve (at thrust plates) between body and thrust bushings, leakage at flange faces, or both	a. Use of flange gaskets.	a. Check to see if flange gaskets are being used; if so, remove gaskets.
	b. Partial O-ring bead on liner faces damaged.	b. Replace liner per "Maintenance" section.
3. Leakage through disc/liner seal	a. Hub seals require adjustment.	a. Adjust per "Hub Seals" portion of "Adjustments" section.
	b. Linkage requires adjustment.	b. Refer to "Linkage" portion of "Adjustments" section.
	c. Actuator has insufficient torque output to close disc against pressure drop. (Actuators are selected to have sufficient torque output to shut off the flow against a specific pressure drop, not necessarily against the maximum allowable pressure drop. Be sure that the pressure drop for which the actuator is selected is not being exceeded.)	c. If possible, check shutoff at lower pressure drops. If shutoff is obtained at low pressure drops, but actuator stalls and does not produce full disc rotation at service pressure drop, actuator output torque is too low. For piston actuators, it may be possible to increase output torque by increasing supply pressure. Do not exceed maximum allowable supply pressure of actuator.
	d. Liner has been damaged by flowing medium or other valve parts damaged by being subjected to service conditions beyond those for which valve is designed.	d. Inspect and replace parts per "Maintenance" section.
4. Valve shaft will not rotate	a. If actuator does not stall but shaft does not rotate, valve shaft key (or spline teeth for splined valve shaft) is sheared.	a. For valves with a keyed valve shaft, refer to the cast actuator bracket instruction manual to disconnect actuator-valve linkage. Rotate shaft manually. If shaft turns, replace key in actuator-valve shaft coupling. For valves with a splined shaft, refer to the actuator instruction manual to remove actuator cover plate. Replace valve shaft per "Maintenance" section if spline teeth are sheared.
	b. If actuator stalls, shaft is binding in bushings due to linkage misalignment caused by excessive wear of linkage parts.	b. Replace linkage parts. Refer to cast actuator bracket instruction manual for assistance in disassembling.
	c. If actuator stalls and linkage is not misaligned, actuator may have insufficient output torque to rotate disc against flow.	c. Check operation with no pressure applied to the valve. If valve now functions properly, actuator is too small.
5. Valve shaft rotates, but valve does not control process fluid	Taper pins (or drive shaft spline for coated disc constructions) have been sheared due to obstruction to disc rotation or other internal parts damaged by being subjected to service conditions beyond those for which the valve was designed.	Inspect and replace parts per the "Maintenance" section.

Check the rotation of the power valve disc per instructions in the "Linkage" portion of the "Adjustments" section. If necessary, adjust the linkage between the actuator and the power valve.

Measure the distance between the valve shaft centers (dimension V in figure 3). The distance between the tandem linkage pivot centers (L) must be the same as dimension V. If necessary, loosen tandem linkage locknuts and rotate linkage barrel to alter dimension L so that it is the same as dimension V.

To check the fully closed position of the slave valve disc, use the partial keyway on the slave valve shaft or measure equal distances between the slave valve face and the top and bottom of the slave valve disc as described in the "Linkage" portion of the "Adjustments" section. Tighten locknuts on tandem linkage when adjustment is complete.

MAINTENANCE

Valve parts are subject to normal wear and must be periodically inspected and replaced as necessary. The frequency of parts inspection and replacement depends upon the severity of service conditions. Instructions are given below

for complete disassembly and reassembly of the valve. Key numbers referenced in this section are shown in figure 5 for uncoated disc construction and in figure 6 for coated disc construction.

Disassembly

WARNING

To avoid personal injury and damage to the process system, isolate the control valve from all pressure and relieve pressure from the valve body and actuator before attempting disassembly.

1. Loosen all flange studs or bolts. Remove all but the bottom flange studs or bolts.

CAUTION

To avoid damage to the valve disc caused by the disc hitting the mating flange, be certain the disc is closed before removing the valve from the pipeline.

2. If necessary, pry flanges apart so that liner faces will not be damaged when valve is being removed. Inspect the disc (key 3) and liner (key 2) for wear or damage.

3. Remove actuator from valve. Follow instructions in the appropriate actuator instruction manual or in the actuator-mounting bracket instruction manual.

4. From both sides of valve, unscrew thrust-plate cap screws (key 10) and remove thrust plates (key 9, figure 5; keys 9 and 11, figure 6).

5. Follow the appropriate procedure below.

For uncoated discs,

a. If taper pin (key 15) ends are peened, grind off peened portions. Driving from smaller end of pins, drive pins out of disc (key 3) and shaft (key 4).

CAUTION

Once the shaft has been removed, the disc may fall from the body, causing personal injury or disc damage. Support the disc before removing the shaft.

b. Pull shaft out of body. If the shaft cannot be pulled from the body, drive the shaft out but use care to avoid upsetting the end of the shaft.

c. Remove disc from body.

For coated discs,

a. Pull the idler shaft (key 5) out of the body. Use the tapped hole in the end of the shaft to engage the screw of a shaft puller.

CAUTION

Once the power shaft (key 4) has been removed, the disc (key 3) may fall from the body, causing personal injury or disc damage. Support the disc before removing the idler shaft.

b. Insert a rod that is slightly smaller than the drive shaft into the shaft hole on the idler side (opposite the actuator side) of body. Push power shaft out of the body with the rod. If it is necessary to drive out the shaft, use care to avoid upsetting the end of the shaft.

c. Remove disc (key 3) from body. For 8, 10, and 12-inch sizes, remove the spacer that was located between power and idler shafts in the disc.

6. Remove bushing sleeves (key 6, figure 5; keys 6 and 12, figure 6) from body. If desired to replace bushing inserts (key 7), remove old bushing inserts from sleeves.

7. Remove liner (key 2) from body.

Some 9500 Series valves have the liner bonded to the body. If the valve has a bonded liner, burn or chip out the liner.

If it is desired to strip the liner out with solvent, use Ecco-strip 57*, Houghto Clean 224†, or equivalent solvent. Cover the valve with solvent bath or enclose the solvent bath around the liner.

Remove all adhesive after the liner has been removed.

Reassembly

Before reassembling, clean all parts that are to be reused. Inspect parts for wear or damage and replace as needed.

1. If new bushing inserts (key 7) are to be used, press new inserts into bushing sleeves (key 6, figure 5; keys 6 and 12, figure 6).

2. Insert liner (key 2) into body. A small amount of silicone grease applied to the outside surface of the liner will aid insertion of the liner. However, do not use grease if the valve is to be used for oxygen service.

*Trademark of Emerson and Cuming Inc.
†Trademark of the Houghton Co.

If liner is to be bonded to the body, Eccobond 285/24LV* bonding agent is recommended. The lettered steps below for bonding the liner are for use with this bonding agent. If a different agent is to be used, follow instructions furnished by the bonding agent manufacturer. In the absence of instructions, consult the Fisher sales representative.

a. Mix the two epoxy components thoroughly and spread a thin coat of the mixture over all bonding surfaces of body and liner.

b. Insert liner into body. Align the liner shaft holes with body shaft holes. Remove excess bonding agent from shaft holes and exposed liner surfaces.

c. Insert disc (key 3), bushing sleeves (key 6, figure 5; keys 6 and 12, figure 6), bushings (key 7), and shaft (key 4) into the body. Be sure bushings engage the liner recesses to ensure proper liner positioning. Rotate disc to closed position.

d. Lay the valve on one valve face and add weights to the other face to ensure a tight bond. Allow to cure for 24 hours.

Proceed with following reassembly steps.

3. Insert bushing sleeves and bushings into body. Be sure that the bushings enter the liner recesses to align the shaft holes. This can be accomplished by temporarily inserting the shaft(s) (key 4, figure 5; keys 4 and 5, figure 6).

4. **For uncoated discs only,** complete the following lettered steps. A new disc and shaft should be installed if the taper pin holes have been widened by loosening of taper pins (key 15).

Omit the following steps "a" through "d" if a new disc and shaft assembly is to be installed or if the old disc and shaft are to be reused.

CAUTION

If a new disc is required, also install a new shaft and taper pins. If a new disc is used with an old shaft, it is necessary to drill a new set of taper pin holes in the shaft, thereby weakening the shaft. The weakened shaft may fail in service. Use new taper pins whenever the disc has been removed.

If a new shaft (without disc) has been purchased, be sure to mark the shaft to indicate disc position as shown in figure 2.

a. Making certain the taper pin holes are on the actuator side of the body, insert the disc into the body. Position the disc at the fully closed position.

Table 5. Taper Pin Details for 9500 Series Valves

Valve Size (Inches)	Shaft Diameter (Inches)	American Standard Taper Pin Size	Drill Size
2	1/2	2	#20 (0.161")
3,4	5/8	3	#16 (0.177")
6	3/4	4	13/64"
8, 10	1	6	9/32"
12	1-1/4	7	21/64"

If the old shaft is available, insert it into the body and disc. Line up the taper pin holes in disc and shaft; measure and record the distance between the body and the keyed or splined end of the shaft. Remove the old shaft and insert the new, undrilled shaft. Position the shaft so that there is the same distance between the body and end of the shaft as was noted above.

If the old shaft is not available, insert the new shaft into body and disc. Measure between the body and the keyed or splined end of the shaft. Make certain that distance is correct to engage the actuator coupling or lever.

Be certain that the partial keyway, flat, or zero mark on the end of the shaft is positioned as shown in figure 2.

b. Use a drill or center punch to mark the taper pin holes in the shaft. Remove shaft and disc from body.

c. Taper pins used in 9500 Series valve shafts and discs are American Standard taper pins as shown in table 5. Using disc as a guide, drill taper pin holes through the shaft using drill size shown in table 5.

d. Use an American Standard taper pin reamer to ream the shaft holes. Be certain the reamer is of sufficient length for the disc hub thickness. Insert the shaft into the disc when reaming. In this way, the disc holes can be used as a gauge for reaming. Allow the reamer to just begin reaming the disc holes. This will ensure proper seating of the pins.

e. Install disc and shaft into body. Be sure the keyed or splined end of the shaft is on the actuator side of the body, that the direction of taper in the taper pin holes match, and that the partial keyway or flat spot is positioned as shown in figure 2.

f. Using a metal sealing compound on the pins for a positive seal, insert taper pins into the larger end of the taper pin holes. Drive pins with a hammer to seat pins.

5. **For coated discs only,**

a. Insert disc (key 3) into body. Be certain the female disc spline is on the actuator side of the body. Position the disc at the closed position.

b. Making certain the partial keyway, flat, or spline marking is positioned as shown in figure 2, install C-ring (key 13) on drive shaft (key 4) and insert drive shaft into actuator side of body and disc.

c. For 8, 10, and 12-inch sizes, install spacer into disc (spacer to be located between power and idler shafts.)

d. Insert idler shaft (key 5).

6. Attach thrust plates (key 9, figure 5; keys 9 and 11, figure 6) with cap screws (key 10). When tightening cap screws, do so in small increments, alternating from one cap screw to another and from one valve side to the other. Tighten cap screws until thrust plates contact the bushing sleeves snugly. Then, rotate the cap screws enough to move the thrust plates 1/32 inch closer to the valve body.

7. Re-attach the actuator per the "Actuator Mounting" section; then install the valve per the "Installation" section.

ACTUATOR MOUNTING

Keyed Valve Shafts

1. Rotate the valve disc to the closed position. To ensure that the disc is fully closed, measure the distances between the valve face and the top and bottom edges of the disc as shown in figure 2. The disc is at the 0-degree position when the two measurements are equal. Rotate the disc slightly if necessary to make the measurement equal.

2. Bolt the actuator-mounting bracket or manual actuator onto the valve and connect and adjust the linkage per the cast actuator-mounting bracket or manual handwheel instruction manual.

Splined Valve Shafts

1. Refer to the appropriate actuator instruction manual to determine the desired actuator mounting style and position. With the valve out of the line, mount the actuator on the valve per instructions in the actuator instruction manual.

2. To determine the fully closed disc position, measure the distances between the valve face and the top and bottom edges of the disc as shown in figure 2. The disc is at the 0-degree position when the two measurements are equal. Rotate the disc slightly if necessary to make the measurements equal.

3. Refer to figure 4 and locate the view that depicts the mounting style and position that is being used. In the appropriate view on the right of figure 4, note the positions of the index marks on the end of the valve shaft and actuator lever. For all positions and styles with 90-degree disc rotation, the shaft index mark is to be aligned with the appropriate lever index mark as shown in figure 4. This is also true for push-down-to-open action with 60-degree maximum disc rotation. However, for push-down-to-close action with 60-degree maximum disc rotation, the appropriate lever index mark must be offset one or two spline teeth counterclockwise from the shaft index mark.

Refer to the appropriate actuator instruction manual for instructions covering attaching the lever and adjusting the turnbuckle. For ***Fishtail*** discs, be certain that direction of rotation will be such that the tail of the disc (see figure 2) will rotate into the downstream side of the valve.

CHANGING DISC ROTATION AND ACTION

Keyed Valve Shafts

Disc rotation can be changed from 0-60 to 0-90 degrees or vice versa by changing the position of the valve shaft coupling and re-adjusting the linkage. Action can be changed from push-down-to-open to push-down-to-close or vice versa by changing the position of the valve shaft coupling. The valve shaft coupling has a selection of four keyways for this purpose.

Refer to the cast actuator bracket manual for assistance in disassembling, selecting the proper keyway, and reassembling the bracket and linkage.

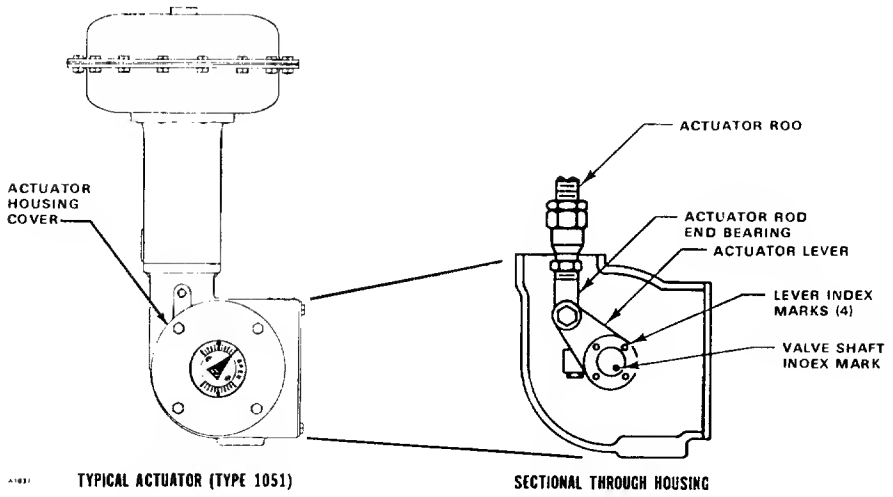
Splined Valve Shafts

Disc rotation can be changed from 0-60 to 0-90 degrees or vice versa by changing travel stops in the actuator and, if necessary, changing the position of the lever on the splined valve shaft. Action can be changed from push-down-to-open to push-down-to-close by removing the actuator and remounting it in the alternate mounting style. Refer to the appropriate actuator instruction manual for assistance in disassembly and reassembly to change travel stops and for instructions to change mounting style.

Note

Action for valves using a splined valve shaft can also be changed without changing mounting style by changing position of actuator lever on valve shaft. For **Fishtail** discs, it will be necessary to rotate disc 180 degrees so that the tail of the disc will rotate into downstream side of valve.

Use the following procedure.



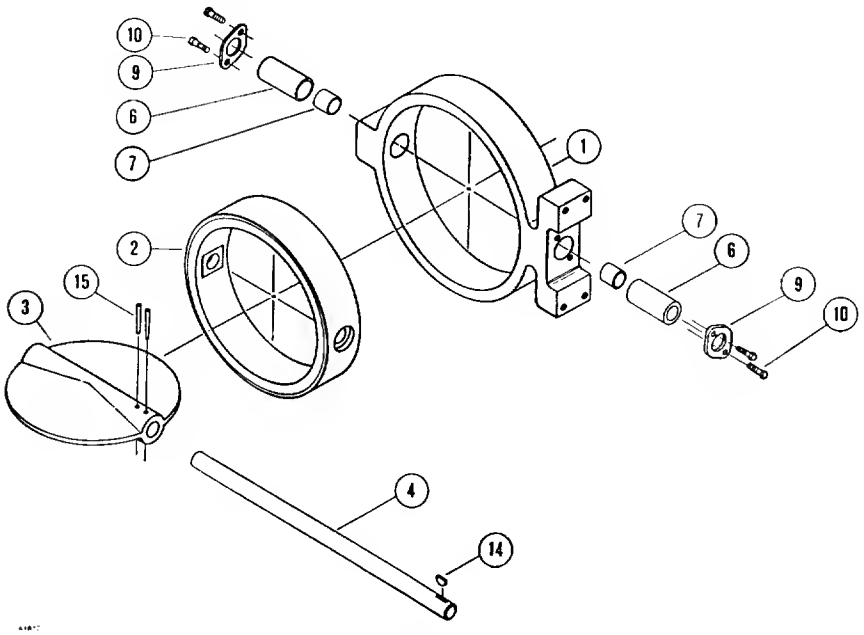
DISC TYPE	ACTUATOR		2 VALVE CLOSED	3 MOUNTING POSITION 1	3 MOUNTING POSITION 2	3 MOUNTING POSITION 3	3 MOUNTING POSITION 4
	Mounting	Style					
Fishtail Disc	Right-Hand Mounting	Style A push-down-to-open 60- or 90-degree operation	FLOW				
		Style B push-down-to-close 90-degree operation 1	FLOW				
	Left-Hand Mounting	Style C push-down-to-close 90-degree operation 1	FLOW				
		Style D push-down-to-open 60- or 90-degree operation	FLOW				
Conventional Disc	Right or Left-Hand Mounting	Style A or D push-down-to-open 60- or 90-degree operation	FLOW				
		Style B or C push-down-to-close 90-degree operation 1	FLOW				

1 FOR 60-DEGREE OPERATION WITH PUSH-DOWN-TO-CLOSE ACTION (EXTENDING ACTUATOR ROD CLOSES VALVE), ROTATE ACTUATOR LEVER COUNTERCLOCKWISE SO THAT LEVER INDEX MARK IS OFFSET 1 SPLINE TOOTH FROM VALVE SHAFT INDEX MARK FOR 1/2 THROUGH 3/4-INCH VALVE SHAFTS AND 2 SPLINE TEETH FROM VALVE SHAFT INDEX MARK FOR 1 AND 1-1/4 INCH VALVE SHAFTS.

2 CURVED ARROWS INDICATE ROTATION REQUIRED TO OPEN VALVE (COUNTERCLOCKWISE WHEN VIEWED FROM ACTUATOR SIDE OF VALVE).

3 ARROWS INDICATE DIRECTION OF ACTUATOR ROD TRAVEL REQUIRED TO OPEN VALVE.

Figure 4. Splined-Shaft Index Mark Alignment for Standard Mounting Position Valve Action Combinations



Key	Description	Part Number
12	Bushing Sleeve—See table 9	
13	C-Ring, SST (coated disc only)	
	2″	L18643 K0012
	3″ & 4″	L18644 K0012
	6″	L18645 K0012
	8″ & 10″	L18646 K0012
	12″	L18647 K0012
14*	Drive Key (keyed valve shaft only) (1 req'd for std. valve; 2 req'd for power valve of 3-way valve ass'y)	
	Alloy steel (for 17-4PH SST shaft)	
	2″	F13576 31252
	3″ & 4″	F13577 31252
	6″	F13578 31252
	8″ & 10″	F13579 31252
	12″	F13580 31252
	Steel (for 316 SST shaft)	
	2″	F13576 24182
	3″ & 4″	F13577 24182
	6″	F13578 24182
	8″ & 10″	F13579 24182
	12″	F13580 24182

Figure 5. Uncoated Disc Construction with Keyed Valve Shaft

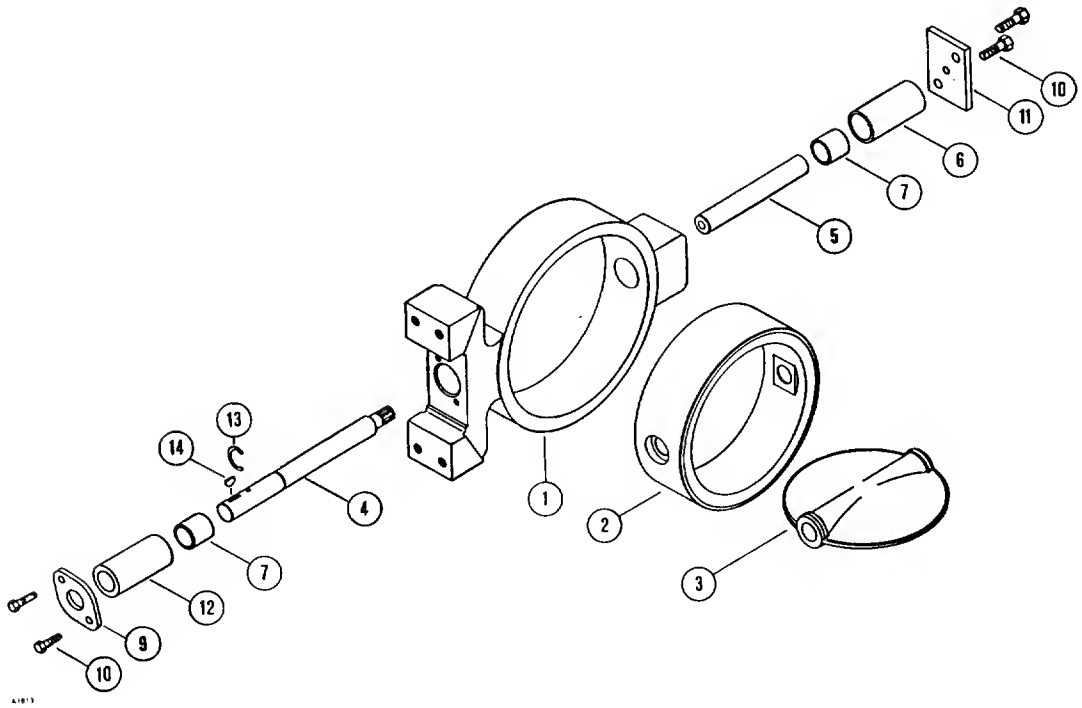


Figure 6. Coated Disc Construction with Keyed Valve Shaft

Key	Description	Part Number
15*	Taper Pin (2 req'd) (for uncoated disc only)	
	17-4PH SST (for 17-4PH SST shaft)	
	2"	F13681 35362
	3"	G11944 35362
	4"	G11942 35362
	6"	G11940 35362
	8"	G11938 35362
	10"	G13291 35362
	12"	H13748 35362
	316 SST (for 316 SST shaft)	
	2"	F13681 35072
	3"	G11944 35072
15*	Taper Pin (Continued)	
	4"	G11942 35072
	6"	G11940 35072
	8"	G11938 35072
	10"	G13291 35072
	12"	H13748 35072
16	Serial Tag, SST (not shown)	F19153 36152
17	Drive Screw, pl steel (2 req'd) (not shown)	F14140 28982
18	Lifting Eye, steel (not shown) 12" only	F19196 28992
19	Flow Direction Tag, SST (not shown) (Fishtail disc only)	G16720 36152
20	Drive Screw, pl steel (2 req'd) (not shown) (Fishtail disc only)	F14140 28982
21	Fishtail Disc Decal (not shown) (Fishtail disc only)	H14850 06992
22	Spacer, SST (not shown) (coated disc only)	
	8"	G10461 38072
	10"	F18311 38072
	12"	G17723 38072

Table 6. Key 1 Valve Body

ANSI CLASS & BODY MATERIAL		VALVE BODY SIZE (INCHES)						
		2	3	4	6	8	10	12
125	Cast Iron	F38740 19012	F38741 19012	F38742 19012	F38743 19012	F38744 19012	F38745 19012	F38746 19012
150	Steel	F38764 22012	F38765 22012	F38754 25242	F38767 22012	F38756 25242	F38757 25242	F38770 22012
	316 SST	F38764 33352	F38765 33352	F38766 33352	F38767 33352	F38768 33352	F38769 33352	F38770 33352
300	Steel	F39825 25242	F39796 25242	F39826 25242	F39153 25242	F39829 25242	F39830 25242	F39827 25242

Table 7. Key 3 Valve Disc

DISC TYPE & MATERIAL		VALVE BODY SIZE (INCHES)						
		2	3	4	6	8	10	12
Fishtail	316 SST	F29550 33352	F29570 33352	F29557 33352	F29526 33352	F29581 33352	F29585 33352	F29589 33352
Conventional	Aluminum Bronze	G21591 12082	G21599 12082	G21603 12082	G21579 12082	G21615 12082	G21645 12082	G21647 12082
	316 SST	G21591 33352	F28461 33352	F28462 33352	F28463 33352	F28465 33352	F28466 33352	F28467 33352
	316 SST Coated with E-CTFE	G25104 K0012	G25105 K0012	G25106 K0012	G25107 K0012	G25108 K0012	G25109 K0012	G25110 K0012

*Recommended spare part.

Table 8. Keys 4 & 5 Valve Shaft

DESCRIPTION	ANSI CLASS	MATERIAL	VALVE BODY SIZE (INCHES) 2	3	4	6	8	10	12
Uncoated Discs									
Key 4 Keyed Valve Shaft[1]	125, 150	17-4PH SST	H16502 35362	H16518 35362	H16521 35362	H16067 35262	H16559 35362	H16558 35362	H16563 35362
		316 SST	H16502 35072	H16518 35072	H16521 35072	H16067 35072	H16559 35072	H16558 35072	H16563 35072
	300	17-4PH SST	K16130 35362	K15509 35362	K16132 35362	J19778 35362	K16135 35362	K16137 35362	K16139 35362
		316 SST	K16130 35072	K15509 35072	K16132 35072	J19778 35072	K16135 35072	K16137 35072	K16139 35072
Key 4 Splined Valve Shaft for Rotary Act.[2]	125, 150	17-4PH SST	L17986 K0012	L17987 K0012	L17988 K0012	L17989 K0012	L17990 K0012	L17991 K0012	L17992 K0012
Key 4 Keyed Valve Shaft for 3-Way Valve[3]	125, 150	17-4PH SST	L15379 K0012	L15381 K0012	L15383 K0012	L15385 K0012	L15387 K0012	L15389 K0012	L15391 K0012
Key 4 Keyed Valve Shaft for Short Ext.[4]	125, 150	17-4PH SST	J19404 35362	K10653 35362	J19208 35362	J10545 35362	J14077 35362	J18493 35362	K10206 35362
		316 SST	J19404 35072	K10653 35072	J19208 35072	J10545 35072	J14077 35072	J18493 35072	K10206 35072
Coated Disc (Keyed Actuator-Valve Shaft Connection)									
Key 4 Power Shaft[1]	125, 150	17-4PH SST	L18623 K0012	L18624 K0012	L18625 K0012	L18626 K0012	L18627 K0012	L18628 K0012	L18629 K0012
Key 5 Idler Shaft	125, 150	17-4PH SST	L18630 K0012	L18631 K0012	L18632 K0012	L18633 K0012	L18634 K0012	L18635 K0012	L18636 K0012

1. Use with Type 1081 trigger-lock handlever; M Series, Type 1073, and 1074 manual handwheel actuators; and Type 480-15, 481-15, 656, and 657 actuators that do not require use of extension between valve and actuator-mounting bracket.
2. Use with Type 1051 and 1061 actuators.
3. Use for power valve of three-way valve assembly.
4. Use if short, open extension is found between valve and actuator-mounting bracket. Short extension required for mounting some actuator types and sizes parallel with pipeline.

Table 9. Keys 6 and 12 Bushing Sleeve

ANSI CLASS & BODY MATERIAL	LINER MATERIAL	DESCRIPTION	VALVE BODY SIZE (INCHES) 2	3	4	6	8	10	12
Uncoated Disc									
125 or 150—Cast Iron or Steel	Nitrile	Key 6, Aluminum (2 req'd)	L12614 11072	L12615 11072	L12616 11072	L12617 11072	L12618 11072	L12619 11072	L12620 11072
	TFE	Key 6, Cd Pl Steel (2 req'd)	L11143 K0012	L11144 K0012	L11145 K0012	L11147 K0012	L11148 K0012	L11149 K0012	L11150 K0012
300—Steel	Either	Key 6, Cd Pl Steel (2 req'd)	L11745 K0012	L11746 K0012	L11747 K0012	L11748 K0012	L11749 K0012	L11750 K0012	L11751 K0012
150—316 SST	Either	Key 6, SST (2 req'd)	L11143 38072	L11144 38072	L11145 38072	L11147 38072	L11148 38072	L11149 38072	L11150 38072
300—316 SST	Either	Key 6, SST (2 req'd)	L11745 38072	L11746 38072	L11747 38072	L11748 38072	L11749 38072	L11750 38072	L11751 38072
Coated Disc									
125 or 150—Cast Iron or Steel	TFE	Key 6, Cd Pl Steel (1 req'd)	L11143 K0012	L11144 K0012	L11145 K0012	L11147 K0012	L11148 K0012	L11149 K0012	L11150 K0012
		Key 12, Cd Pl Steel (1 req'd)	L18648 K0012	K18649 K0012	K18650 K0012	K18651 K0012	K18652 K0012	L18653 K0012	L18654 K0012
150—316 SST	TFE	Key 6, SST (1 req'd)	L11143 38072	L11144 38072	L11145 38072	L11147 38072	L11148 38072	L11149 38072	L11150 38072
		Key 12, SST (1 req'd)	L18648 K0022	L18649 K0022	K18650 K0022	L18651 K0022	L18652 K0022	L18653 K0022	L18654 K0022

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